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ABSTRACT

A study was conducted to construct a cloze screening instrument to gain information about the reading capabilities of college students enrolled in specific courses and to find out what support services these students needed. Subjects included 464 college students ranging from entering freshmen to graduate students. Cloze passages were constructed from randomly selected portions chosen from required texts and consisted of 250 words plus complete beginning and final sentences. Results of the cloze tests were scored with synonyms and without synonyms. Results showed that (1) cloze tests were valid measures of reading comprehension at the college level, (2) more than a single passage should be included on a screening instrument, (3) altering the format of the passages did not alter the stability of test results, (4) scoring of passages including synonyms did not increase the construct validity of the test, (5) a significant correlation existed between cloze test scores and achievement in college, (6) mean scores differed significantly in different content areas, and (7) identification of students' reading capabilities indicated a need for student counseling, adjunct classes, and special reading development classes. (HOD)

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Construction and Practicability of Cloze procedures In Diagnosis and Establishing Support Programs in College Reading

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Student's scores on college entrance tests such as the SAT and the ACT have for some time reflected declines in achievement. Parallel to this decline in entrance examination scores is a decline in college student's reading comprehension scores (Mullen & Chamness, 1977). In view of these declining scores, we felt it appropriate to ascertain college student's ability to read the texts assigned at the college level.

The Student Assistance In Learning*(SAIL) program, a federally funded project to provide student support services, gave the impetus for us to initiate procedures in the identification and remediation of specific reading problems.

We needed to determine the match between student's reading ability and the reading required in college. Several factors contributed to our decision to use the cloze procedure for a screening instrument rather than a standardized test of reading comprehension. First, since college courses are taught by instructors who have autonomy in choosing texts and text choice is generally based on content rather than readability, we could not request instructors to change texts. Second, students often take several courses in which context and readability are different; hence, a single general test of reading comprehension might not be relevent for a variety of content materials. The cloze

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procedure gauges the readability of a particular text for a specific group of students. Third, the closer reading test procedures approximate actual teaching situations, the more functional the estimate of reading ability will be (Jones & Pikulski, 1974). Since cloze tests can be constructed from any reading text, they are appropriate for any course material. Fourth, cloze procedure measures literal comprehension and we hypothesized that, if students could comprehend the text at a literal level, instructors would provide the additional insight needed for higher level comprehension.

Cloze procedure refers to a reading passage in which words are systematically deleted and blanks are left in place of these deleted words. The student is then instructed to fill in the blanks with the word the author would have used. Cloze requires readers to use their own background of experiences, language facility, and knowledge of the syntax and semantics of a particular content area.

Previous researchers have established the validity (Bormuth, 1967; 1969; Gallant, 1965; Ruddell, 1964) and reliability (Vaughn & Meredith, 1978) of cloze procedure as a measure of literal level reading comprehension and have established criteria for using the results of cloze tests for diagnosing students' reading capabilities. However, these researchers worked with pre-college level students. We were interested in constructing a screening instrument to gain information about the reading capabilities of college students enrolled in specific courses. We also wanted to find out what support services we should provide for students needing

help. Therefore, we constructed and administered cloze tests to students enrolled in eleven different courses.

Screening instruments were administered during the first week of the term by one of the researchers. Results reported in this study were acquired during three consecutive quarters of the 1980-1981 academic year. The following sections of this paper will describe: (1) the student population, (2) courses and measuring instruments, (3) procedures in construction of screening instruments, (4) scoring of cloze tests, (5) statistical evaluation and interpretation of test results, and (6) support services available for students.

Population

California State College, San Bernardino, (CSCSB) is a four-year college with a student body of approximately 4,500 students. Class size at CSCSB is generally small (20-25 students) with a few large lecture classes (such as Social Science 146).

Subjects in this study were 464 college students, 180 male and 275 female, with a mean age of 25 years and a mode of 18 years. Student class level ranged from entering freshmen through graduate level. Mean overall grade point average for the subjects was 2.56.

The procedure for the students was as follows: (1) listen to and read the directions, (2) do the sample cloze passage, (3) read the passage, and (4) fill in the blanks with appropriate words.

The eleven different courses and cloze screening instruments used in each course are described in the following section.

Courses and Screening Instruments

Two types of instruments were used to assess students' reading achievement: cloze tests based on required texts in specific classes and a standardized achievement test, the Iowa Tests of Educational Development (ITED). The ITED was given to two classes: Education 345/445 and Humanities 99. Two sections of the ITED were used: Reading Comprehension and Vocabulary.

Table 1 shows the number of subjects enrolled in each course, the number of sections into which each class was divided, the number of cloze passages used in the screening instrument and how often words were deleted in the cloze passages.

Insert Table 1 here

Math 80 is a lower division, self-paced, remedial algebra course. The text focuses on numerical problem solving and has very limited conceptual explanations. The cloze test consisted of three passages taken from a single text. In each passage, every fifth word was deleted.

Physics 100 is a lower division, general survey of physics designed for students with little or no background in science and math. The cloze test consisted of four passages taken from a single text; in each passage every fifth word was deleted.

Chemistry 215 is a highly technical course required for all science majors which focuses on atomic structure and chemical bonding. A single text was used to construct five cloze passages with every fifth word deleted in each passage.

Natural Science 312 (Ascent of Man) is an upper division general studies science course which explores scientific discoveries

which have shaped human history. The cloze test, consisting of three selections with every fifth word deleted, was constructed from a single text.

Theatre Arts 120 (Oral Communications) is a lower division general education course focusing on the characteristics of human communication in a variety of settings. The cloze test consisted of four passages with every fifth word deleted and was constructed from a single text.

Social Science 146 (American Civilization) is a lower division general education course in which students examine the historical development of the fundamental values of American culture. Two texts were used to construct the screening instrument consisting of four cloze passages, two passages taken from each text, with every fifth word deleted.

Administration 302 (Human Behavior in Organizations) is a basic upper division requirement for all administration majors. Students are instructed in how to analyze human behavior in organizations. A single text was used to construct a cloze test originally consisting of four passages with every fifth word deleted. As a result of a typographical error in one passage, only three passages were used in this study.

English 303 (Analysis of Prose Fiction) is an upper division basic literature class focusing on analysis of prose fiction. The cloze test was prepared using four passages, each written by a different author. Two forms of each passage was used: one with every fifth word deleted and the other with every tenth word deleted.

Social Science 333 (Sanity and Civilization) is an upper division general studies class focusing on the effects of social, political, and economic institutions of civiliations on sanity and insanity. Three cloze passages with every fifth word deleted were constructed from the two texts used in the course. From one text, a collection of articles, two selections were chosen; the third selection was taken from a single authored text.

Education 345/445 (Reading in the Elementary and Secondary Schools) is an upper division course in education required by the State of California for a basic teaching credential. Content includes methods of diagnosing and teaching of reading. The four passages were taken from a single text. Each passage had two forms: every fifth word deleted and every tenth word deleted.

Humanities 99 (Reading Enhancement) is a remedial reading course for incoming freshmen designed to supplement the students' reading capabilities. The cloze test for these students was a composite test consisting of four 250 word passages with every fifth word deleted; each passage was from a different content area: theatre arts, social science, physics, and literature.

Although screening instruments differed in number of passages and specific passages used, the construction prerequisites for each of the screening instruments were the same.

CONSTRUCTION OF SCREENING INSTRUMENTS

In the construction of screening instruments, three aspects were considered: (1) required reading for a course, (2) student frustration level, and (3) length of time available for testing.

Cloze passages were constructed from randomly selected por-

tions chosen from required texts. All passages were 250 words in length plus a complete beginning and final sentence. If the textbook section had a title, the title was included with the text in the screening instrument.

Since some courses required students to read more than one text, sample passages were taken from each text; similarly, with texts having multiple authorship, passages were chosen to represent the variety of writing styles contained in the text.

Student concern and frustration when responding to the cloze tests prompted our interest in modifying the cloze format. Hence, in two courses parallel forms of the cloze passages were constructed; one form had every fifth word deleted and the other form had every tenth word deleted.

Although we did not impose a time limit, in most cases the amount of time available for testing was approximately forty minutes (the majority of one class period). Initially we included five passages in each screening instrument because we expected students to read approximately 250 words per minute. During the preliminary stages of this study we found that most students were able to successfully complete only three passages in a forty minute period. Hence, our most recent screening instruments consist of only three passages.

In addition to constructing the screening instruments, we had to determine criteria for scoring cloze passages and for indicating to students what their reading capabilities were.

SCORING

The results of the cloze tests in this study were scored in

two ways: without synonyms and with synonyms. Scoring was done in this manner for two reasons: (1) to increase face validity and (2) to determine how each scoring method correlated with achievement.

It was important to increase the face validity of our reading tests because diagnostic reading screening has not been widely used at the college level. Students and faculty alike were uncomfortable about testing reading ability, particularly with a format as different from the standard reading comprehension as the cloze task. In as much as students and faculty thought they would both be unable to fill in the exact word, we felt it important to reassure them by counting synonyms as correct answers.

The original research (Bormuth, 1968, 1969) and later exponents of cloze technique recommend scoring using only exact replacement of missing words (Robinson, 1978; Burmeister, 1978; Estes and Vaughn, 1978; McKenna, 1976). However, cloze technique requires readers to use the syntax and semantics of the passage (Singer & Donlan, 1980) and their own prior experience and language facility (Jones & Pikulski, 1974). In previous research with cloze tasks, the subjects have been students below the college level. Since college students generally have a better background of experience and language facility than do younger students, we suspected that college students would be more likely to use a variety of synonyms available in their repertoire. Hence, we counted synonyms as correct so we could determine if this manner of scoring would affect our diagnosis of student's reading capabilities.

For cloze testing to be useful, scores must be categorized in some way. Cloze scores are generally used to categorize students' reading capability into one of three reading levels: frustration, instructional, and independent. All scoring in this study, as well as suggested criterion scores, are reported in percentage of accuracy. The criteria commonly suggested (Singer & Donlan, 1978; Burmeister, 1978; Bormuth, 1967) without synonyms for this placement is 0-43% frustration, 44%-57% instructional, 58%-100% independent reading level. However, other researchers (Bean, 1980; Jones & Pikulski, 1974) have suggested much lower cut-off points. Prior to actually beginning the screening process, we planned to use the following criteria without synonyms: 0-39% frustration, 40%-59% instructional, and 60%-100% independent reading level. However, after we scored the tests, we found that the mean score for all subjects on all passages without synonyms to be 43%. This suggested that the average student was barely at the instructional reading level. In order to give both students and faculty a more realistic estimate of individual's reading capability, we looked at the mean score with synonyms (53%). We decided that use of the total score including synonyms would more accurately reflect student's reading capabilities and needs for various support services.

In addition to "eyeballing" the test results for scoring and categorizing student achievement, we used statistical analysis of the data to glean additional information about the construction, validity, and subsequent interpretations of student's scores on

cloze passages.

Statistical analysis of the data was used to answer the following questions:

1. Are cloze tests valid measures of reading ability at the college level?
2. Are the scores dependent upon the specific passage used: That is, is the reading material assigned in a single course of equal difficulty or does it vary? What is the generalizability of cloze scores on a single passage within a single course?
3. What is the stability of cloze test scores when the deletion pattern is modified?
4. Does counting or not counting synonyms as correct responses alter the stability of cloze scores?
5. What is the relationship between reading ability and (1) overall grade point average (GPA) and (2) grade in a specific course? And a subsidiary question, can cloze test scores be used to predict a student's grade in a specific course?
6. Should the criteria used for evaluating students' reading ability be the same in all content areas? That is, does content area alter passage difficulty?

VALIDITY OF CLOZE READING TESTS

Since previous research (McKenna, 1976; Bormuth, 1967) related to cloze validity has not been done at the college level, we wanted to investigate the validity of using cloze tests at the college level. We administered the reading comprehension and

vocabulary sections of the ITED to two classes: Education 345/445 and Humanities 99. As revealed in Table 2, the correlations

Insert Table 2 here

between reading comprehension were statistically significant; that is, the correlations were high between individual passages and both comprehension and vocabulary. This finding supports those of previous researchers and suggests that cloze tests are valid measures of college reading ability. Since cloze tests are valid measures of college reading ability, the statistical and constructional issues of cloze testing must be addressed.

PASSAGE DEPENDENCE

One consideration in constructing a screening instrument must be the number of passages to be included. If the reading material assigned in a single course is all of equal difficulty, then a single passage would give sufficient diagnostic information. Vaughn and Meredith (1978) indicate that caution must be exercised when using cloze test scores based on a single passage. Hence, our screening instruments had three or four passages each. Analysis of variance was used to ascertain whether passages for a single course were of the same difficulty. Exact replication scores were used for this analysis. For most classes, the results of the ANOVA demonstrated that reading material within a class was of consistent difficulty. That is no differences between classes were found in English 303, Education 345/445, Social Science 333, Natural Science 312, Chemistry 215, Math 80, and Administration 302. In three classes, significant differences were

found: (1) Theatre Arts 120 (one text), (2) Social Science 146 (two texts), and (3) Physics 100 (one text).

Although there were no differences between passages for a single course in the majority of courses, there were some differences revealed. These differences occured independent of whether a single text or multiple texts were required reading. Our findings support those of Vaughn and Meredith (1978) and indicate that more than one passage should be used for each course when constructing a screening instrument.

STABILITY AND FORMAT

One of the problems we encountered in administering cloze screening instruments was student frustration. We hypothesized that increasing the amount of content provided would decrease the student frustration level. However, we needed to determine the effect altering the format of the test should have on result stability.

The generally accepted format of cloze testing has been to delete every fifth word. Criteria for diagnosis of students' reading ability has been based on this format. For a criterion score to be considered stable, all forms of a test using the same passage should provide the same index of students' ability on that passage.

To investigate this facet of stability, we constructed two forms of cloze tests on the same passages; on one form we deleted every fifth word and on the other form we deleted every tenth word. ANOVA revealed no significant difference between scores on the fifth and tenth word deletion for the same passage. Additionally,

oral discussion with students after they took both forms of the test indicated that their frustration level was, indeed, lower on the passages in which every tenth word was deleted. However, since the size of our sample for this analysis was small, we are continuing our examination of this facet of cloze construction. If further investigation reveals no difference between the two formats, we will use the tenth word deletion format in the future.

STABILITY AND SYNONYMS

The nature of cloze test construction and scoring prompted a consideration of analysis of results using synonyms as correct answers. Three aspects of the synonym question were evaluated: (1) does synonym use alter the readability level of a passage for students? (2) does synonym use increase the correlation of results with reading comprehension and thus increase the validity of cloze testing? and (3) does counting synonyms as correct increase the face validity of the instrument?

To find out if synonyms altered the readability level of a passage, we compared mean scores on a passage to see if there was a significant difference when synonyms were counted as correct. Results of this analysis indicated no difference in readability level when synonyms were counted as correct. Additionally, even in a class with a significant difference in the readability of assigned texts, synonym use did not alter the ranking of individual students. Nor did it raise the readability of the text because, as revealed in Table 3, when the text is difficult, the

ability to supply synonyms is substantially reduced.

Insert Table 3 here

Second, to ascertain the validity of counting synonyms as correct answers, we analyzed the correlation between cloze scores and reading comprehension and vocabulary scores on the ITED. As shown in Table 2, there were no statistically significant differences between cloze scores with and without synonyms. Synonym use does not increase the utility of cloze scores.

Face validity of cloze testing was a problem we encountered. Since students take a cloze test during the first week of instruction, before they have read the text, both students and instructors felt that it was unfair to accept only exact replication as the correct response. Therefore, to increase the face validity, we scored the tests in two ways: with and without synonyms. Although counting synonyms as correct may increase face validity, for future testing we recommend using only exact replication scores for two reasons: (1) no increase in construct validity of cloze testing results when synonyms are accepted as correct and (2) scoring tests by exact replication is clerically much more rapid.

READING ABILITY AND COLLEGE ACHIEVEMENT

The relationship between two aspects of achievement and reading ability were investigated: course grade and overall grade point average (GPA). Correlational analysis using all 465 subjects in all classes revealed a significant correlation between cloze test scores and course grade ($< .001$) and between

cloze test scores and GPA ($< .001$). When correlation of cloze scores with course grade and GPA was analyzed by course, we found that reading scores and achievement were not related in two classes: Math 80 and Chemistry 215. It seems likely that the technical nature of the content of these classes alters the importance of reading to gain information.

In sum, we can say that reading capability is an important factor in college achievement in most content areas. Although the correlation between cloze test scores and achievement is statistically significant, analysis of the data also reaveals low correlation coefficients (.2-.3) between specific cloze passages and achievement. These findings are in agreement with those of Spring (1975) who found a low correlation coefficient between course grade and cloze score for two-year college students. Such low correlation coefficients prohibit the use of a reading score on a particular passage or group of passages to predict course grades. Nevertheless, cloze is a useful device for finding out which students are in need of support services to facilitate comprehension of course information.

CRITERION FOR CLOZE SCORES

Two aspects of criterion levels for use with cloze scores need to be considered: (1) differences in mean scores in each content area and (2) specific cut-off points for student diagnosis.

Criterion scores suggested for cloze tests (Singer & Donlan, 1980; Bormuth, 1967) have not differentiated between reading material in different content areas. That is, the same criteria have been used for all content areas. Some investigators (Jones and

Pikulski, 1974; Cohen, 1975) have indicated that content material in some subjects increases the difficulty of performing on cloze tests.

We have investigated this problem in two ways. First, we looked at the mean scores on passages in different content areas.

Table 4 here

As revealed in Table 4, there is a significant difference between mean scores on passages in different content areas. For example, the mean scores in three lower division courses, Math 80 (63), Physics 100 (46) and Social Science 146 (49) vary appreciably. In addition, mean scores in upper division such as Administration 302 (37) and Education 345/445 (57) also vary widely.

Second, we gave students in one class (Humanities 99) a composite cloze test made up of passages from four different content areas: theatre arts, social science, physics, and literature. ANOVA indicated a statistically significant difference ($<.05$) between the passages. As perusal of Table 5 reveals,

Table 5 here

students were better able to read materials from theatre arts and social science than they were able to read materials from physics and literature.

Based upon the results of this research, it appears that students found some content materials easier to read than others. In addition to noting the variations in mean scores in different content areas, we analyzed the size of the mean scores. Mean

cloze scores obtained by our population of college students were generally below the 44% and 57% criteria commonly used by classroom teachers to designate the lower limits for instructional and independent reading levels for both lower division and upper division students.

Therefore, we recommend that the criteria for diagnosing student reading ability be related to a specific course. That is, diagnostic references should be course specific. Perhaps criteria should be established based upon the distribution of reading scores within a course, that is, the mean and standard deviation should be used to determine specific course criteria at the college level. Since differences in mean scores in various content areas do exist, the criteria for diagnosing student's reading ability should be evaluated in light of these differences.

We selected the mean score as a cut-off point because, for college students, this seems to be appropriate. We would expect college students at or above the mean score to be successful in comprehending the required reading material in a particular course.

After the cloze tests in our study were administered and scored, the results were returned and interpreted to students in each class by the researchers. Opportunity was provided for individual student counseling to aid students in choosing the appropriate support service.

SUPPORT SERVICES

In addition to the diagnostic reading screening tests being given in many basic studies courses, three areas of support ser-

vices in reading are available to students: (1) individual reading diagnosis and counseling, (2) remedial reading courses, and (3) reading adjunct courses.

Individual reading counseling consists of administering a standardized test (in addition to appropriate cloze tests), using item analysis to determine specific areas of strength and weakness, followed by prescribing an individualized program of instruction for the student. The student then meets with the counselor on a weekly basis for instruction and follow-up. Students may self-select this counseling or they may be referred to this aspect of the program by an academic advisor, a counselor, or an instructor.

The remedial reading course (Humanities 99) is offered as a basic developmental reading course in which students are taught such skills as (a) finding the topic and main idea of a paragraph or group of paragraphs, (b) vocabulary development, (c) using flexible reading rates, and (d) study techniques such as SQ3R. Students may self-select this course or may be advised to take this course as a result of their performance in a particular class on either the cloze or standardized tests.

The adjunct courses are reading and study skills courses taught in conjunction with regular academic courses. Two adjunct courses are presently offered: one with Social Science 146 (American Civilization) and one with English 110 (World Literature). Since the primary function of the adjunct class is to assist students in reading and learning from texts, the content area reading techniques emphasized in these classes are taught using the textual readings required by the regular class instructor

and supplemented with practice exercises.

Students are eligible to take adjunct classes only if they are enrolled in the regular academic course with which the class is paired. Students may self select the adjunct course or may be advised to take the course on the basis of test results or previous achievement in this academic area.

SUMMARY

Students' ability to read required texts is an important factor in success in college. Therefore diagnostic screening instruments using cloze passages were constructed to assess students' reading capability. Both the practical concerns of helping students and the theoretical issues of valid test construction were considered in this study. Theoretical findings include the following:

1. Cloze tests are valid measures of reading comprehension at the college level.
2. More than a single passage should be included on a screening instrument because passage difficulty may vary in a single class.
3. Altering the format of cloze passages did not alter the stability of test results. However, the small sample used in this facet of the investiagation suggest that further study is needed.
4. Scoring of cloze passages including synonyms did not increase the construct validity of test results.

5. There was a significant correlation between cloze test scores and achievement in college. However, the low magnitude of the correlation coefficient indicates that students' scores on a single passage cannot be used to predict individual student's grades.
6. Mean scores on cloze tests differ significantly in different content areas. Some content materials are easier to read than other content materials. Consequently, we suggest setting up course specific criteria for student evaluation.

We found that cloze screening instruments enabled specialists to identify reading levels of college students in specific courses. Identification of students' reading capabilities indicated a need for a variety of support services: (1) counseling, (2) adjunct classes, and (3) special reading development classes.

Table 2: Correlations Between Cloze Passages and ITED

Format	Comprehension	Vocabulary	Subject
Exact Replacement	.71*	.67*	Theatre Arts
With Synonyms	.71*	.68*	Theatre Arts
Exact Replication	.79*	.73*	Social Science
With Synonyms	.76*	.73*	Social Science
Exact Replacement	.67*	.77*	Physical Science
With Synonyms	.66*	.77	Physical Science
Exact Replication	.48**	.69*	Literature
With Synonyms	.50***	.69*	Literature

* .001

** .009

*** .006

Table 1: Description of Courses and Screening Instruments

Course	Number of Students	Deletion Pattern	Course Sections	Cloze Passages
Humanities 99	39	5th word	2	4
Math 80	21	5th word	2	3
Physics 100	23	5th word	1	4
Chemistry 215	38	5th word	1	5
Natural Science 312	39	5th word	1	3
Theatre Arts 120	90	5th word	5	4
Social Science 146	104	5th word	1	4
Administration 302	34	5th word	2	4(3)
English 303	12	5th-10th	1	4
Social Science 333	31	5th word	1	3
Education 345/445	25	5th-10th	1	4

Table 4: Mean Scores On A Cloze Passage Exact Replication

Course	Number	Mean Score	Standard Deviation
Humanities 99	33	32.57	11.07
Math 80	21	62.85	7.55
Physics 100	23	45.65	8.01
Theatre Arts	89	63.48	12.12
Social Science 146	100	48.96	11.55
Chemistry 215	38	50.26	18.12
Administration 302	34	37.47	9.9
English 303	7	50.47	18.14
Natural Science 312	39	40.97	15.49
Social Science 333	21	31.62	9.75
Education 345/ 445	25	56.69	8.85

$F = 25.4228$ $(< .00001)$

Table 5: Mean Scores by Subject Area on Composite Cloze Tests

Subject	Mean Score
Theatre Arts	32.47
Social Science	34.39
Physics	20.47
Literature	23.47

Table 3: Mean Scores for Social Science 146

Text	Exact Replication	Synonyms	Total
America	48.96	10.40	59.52
Ameriea	40.42	7.76	48.18
Images	24.51	2.70	27.22
Images	32.53	4.39	37.12

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